

***Conservation Assessment
for
Greenbrier Cave Beetle (*Pseudanophthalmus fuscus*)***



(from Barr, 1960)

USDA Forest Service, Eastern Region

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This Conservation Assessment was prepared to compile the published and unpublished information on Pseudanophthalmus fuscus. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The Greenbrier cave beetle is designated as a Regional Forester Sensitive Species on the Monongahela National Forest in the Eastern Region of the Forest Service. The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve the species.

Pseudanophthalmus fuscus is a rare ground beetle that has been reported from 24 caves in eastern West Virginia in Greenbrier, Monroe and Pocahontas counties.

NOMENCLATURE AND TAXONOMY

Classification:	Class Insecta Order Coleoptera Family Carabidae
Scientific name:	<u>Pseudanophthalmus fuscus</u>
Common name:	Greenbrier cave beetle
Synonyms:	<u>Pseudanophthalmus subaequalis</u>

DESCRIPTION OF SPECIES

Pseudanophthalmus fuscus is an eyeless, unpigmented carabid beetle that is distinctly red in appearance. Dissection and slide mounting of the genitalia for microscopic examination are required for identification. This species can be identified only by a specialist in the taxonomy of the genus Pseudanophthalmus.

LIFE HISTORY

Nothing is known of the life history of Pseudanophthalmus fuscus. However, Barr (personal communication, 2001) reported that in most of the troglobitic carabid beetles of eastern North America egg laying is timed for the fall, because food is generally more prevalent then. Larvae appear in the winter, pupae in the late winter and early spring, then teners start appearing in June and July. The beetles are almost all fully sclerotized by fall. Although this is a typical life history, the availability of food can change the cycle. The primary food source of Pseudanophthalmus is enchytraeid and tubificid worms found associated with cave mudbanks.

HABITAT

Pseudanophthalmus fuscus is a troglobite and will thus be found only in caves. Holsinger, et al. (1976) did not report any specifics about the beetle's microhabitat

preference, but Pseudanophthalmus in general are creatures of riparian habitats, where they occur on mudbanks, stream gravels, detritus and similar situations.

DISTRIBUTION AND ABUNDANCE

This beetle was reported from 24 caves in Greenbrier, Monroe and Pocahontas counties, West Virginia (Holsinger, Culver & Baroody, 1976). It was reported as being uncommon in all localities. Barr (personal communication 2001) reported that the range reported by Holsinger, et al. (1976) was in the broad sense of the species and that it does not actually occur in Pocahontas County as currently understood.

RANGEWIDE STATUS

Global Rank: G2 imperiled; The global rank of G2 is assigned to species that are known from 6-20 localities. Pseudanophthalmus fuscus has been reported from 24 caves, although some of these must be subtracted if the Pocahontas County records are considered to be a different species (Barr, personal communication 2001).

State Rank: S2 imperiled; The state rank of S2 is similarly assigned to species that are reported from 6-20 localities within the state. Pseudanophthalmus fuscus is endemic to West Virginia.

POPULATION BIOLOGY AND VIABILITY

Holsinger, et al. (1976) reported that Pseudanophthalmus fuscus was a polytypic species, represented by perhaps two or three subspecies. Populations from caves in Monroe County differed morphologically from those in Greenbrier and Pocahontas counties.

POTENTIAL THREATS

Due to the presence of Pseudanophthalmus fuscus in the restricted cave environment, it is susceptible to a wide variety of disturbances (Elliott, 1998). Caves are underground drainage conduits for surface runoff, bringing in significant quantities of nutrients for cave communities. Unfortunately, contaminants may be introduced with equal ease, with devastating effects on cave animals. Potential contaminants include (1) sewage or fecal contamination, including sewage plant effluent, septic field waste, campground outhouses, feedlots, grazing pastures or any other source of human or animal waste (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al 1996, 1997, 1998); (2) pesticides or herbicides used for crops, livestock, trails, roads or other applications; fertilizers used for crops or lawns (Keith and Poulson, 1981; Panno, et al. 1998); (3) hazardous material introductions via accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Habitat alteration due to sedimentation is a pervasive threat potentially caused by logging, road or other construction, trail building, farming, or any other kind of development that disturbs groundcover. Sedimentation potentially changes cave habitat, blocks recharge sites, or alters flow volume and velocity. Keith (1988) reported that pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

Impoundments may detrimentally affect cave species. Flooding makes terrestrial habitats unusable and creates changes in stream flow that in turn causes siltation and drastic modification of gravel riffle and pool habitats. Stream back-flooding is also another potential source of introduction of contaminants to cave ecosystems (Duchon and Lisowski, 1980; Keith, 1988).

Smoke is another potential source of airborne particulate contamination and hazardous material introduction to the cave environment. Many caves have active air currents that serve to inhale surface air from one entrance and exhale it from another. Potential smoke sources include campfires built in cave entrances, prescribed burns or trash disposal. Concerning the latter, not only may hazardous chemicals be carried into the cave environment, but the residue serves as another source of groundwater contamination.

Numerous caves have been affected by quarry activities prior to acquisition. Roadcut construction for highways passing through national forest land is a similar blasting activity and has the potential to destroy or seriously modify cave ecosystems. Indirect effects of blasting include potential destabilization of passages, collapse and destruction of stream passages, changes in water table levels and sediment transport (Keith, 1988).

Oil, gas or water exploration and development may encounter cave passages and introduce drilling mud and fluids into cave passages and streams. Brine produced by wells is extremely toxic, containing high concentrations of dissolved heavy metals, halides or hydrogen sulfide. These substances can enter cave ecosystems through breach of drilling pits, corrosion of inactive well casings, or during injection to increase production of adjacent wells (Quinlan and Rowe, 1978).

Cave ecosystems are unfortunately not immune to the introduction of exotic species. Out-competition of native cavernicoles by exotic facultative cavernicoles is becoming more common, with species such as the exotic milliped Oxidus gracilis affecting both terrestrial and aquatic habitats.

With the presence of humans in caves comes an increased risk of vandalism or littering of the habitat, disruption of habitat and trampling of fauna, introduction of microbial flora non-native to the cave or introduction of hazardous materials (e.g., spent carbide, batteries). The construction of roads or trails near cave entrances encourages entry.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

Much of the range of Pseudanophthalmus fuscus falls within the boundary of the Monongahela National Forest, including the type-locality at Coffman Cave, Greenbrier County, which is within, but apparently not owned by the national forest. Other sites within the MNF in, but privately owned: Greenbrier County: Arbuckle, Benedict's, Bransford, Fox, Foxhole #1, Grapevine, Higginbotham's, Jewel, McClung, Organ and Pollock caves; Pocahontas County: Blue Spring and Bolling caves. Piddling Pit Cave in Pocahontas County is owned by The Nature Conservancy. The Monroe County sites for this species within the Jefferson National Forest are Coburn, Fletcher, McClung-Zenith, Patton, Rock Camp and Union caves.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

There are no species specific activities relating to Pseudanophthalmus fuscus.

The existing (1985) Monongahela Land and Resource Management Plan does not provide management direction for caves although they are being considered in the Forest Plan revision currently underway. A Forest Plan Amendment in progress for Threatened and Endangered Species will include management for the caves on the forest.

RESEARCH AND MONITORING

Much of what is known about Pseudanophthalmus fuscus was gathered during the project of Holsinger, et al. (1976), in which data from 190 caves in 14 counties was gathered.

RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

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